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12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 words*)

This presentation shows the facilities available at the Naval Electromagnetic Radiation Facility. Some areas include: Test areas, Continuous Steel Ground Plane, Aircraft Anechoic Test Facility, the hangar, Test Vans, Telemetry Van Layout, Radar Transmitters,Amplifiers, Modulation Sources, etc.

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Encl (3)

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Naval Electromagnetic Radiation Facility Capabilities Description

Naval Electromagnetic Radiation Facility Capabilities Description

Facilities

- Test Areas
- Test Vans
- Transmitter Equipment
- E-Field Calibration Equipment

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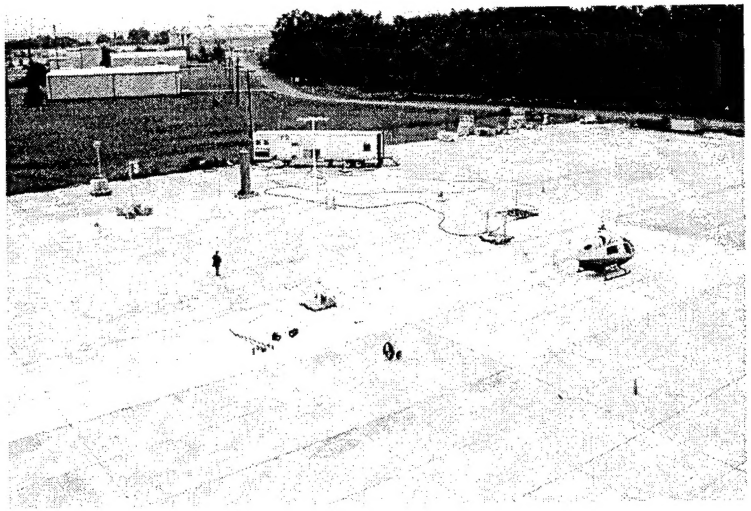
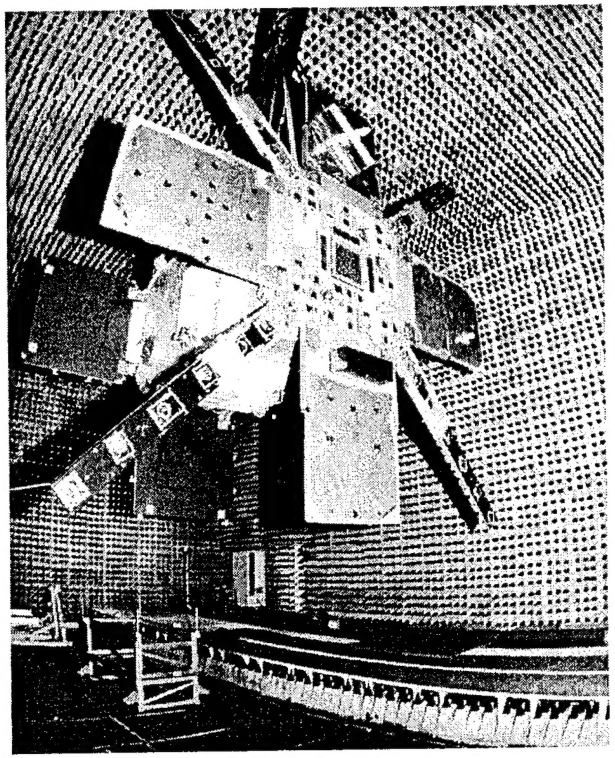
Test Areas



- Hangar Apron (embedded ground plane)



- AATF

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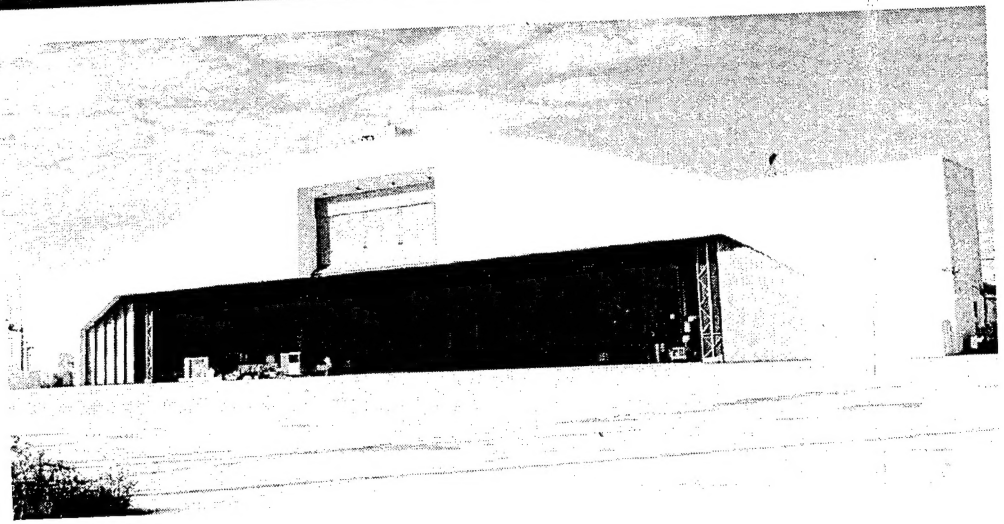
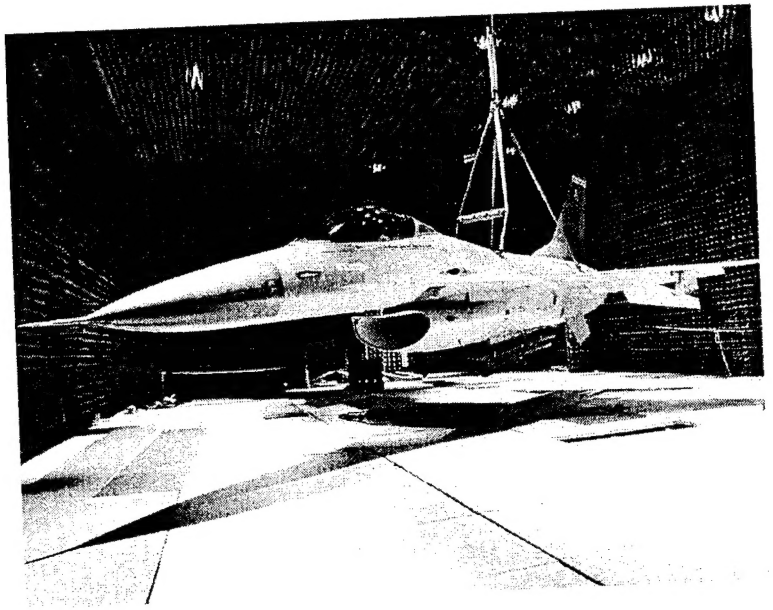
Test Areas



- Inside Hangar



- Inside AATF

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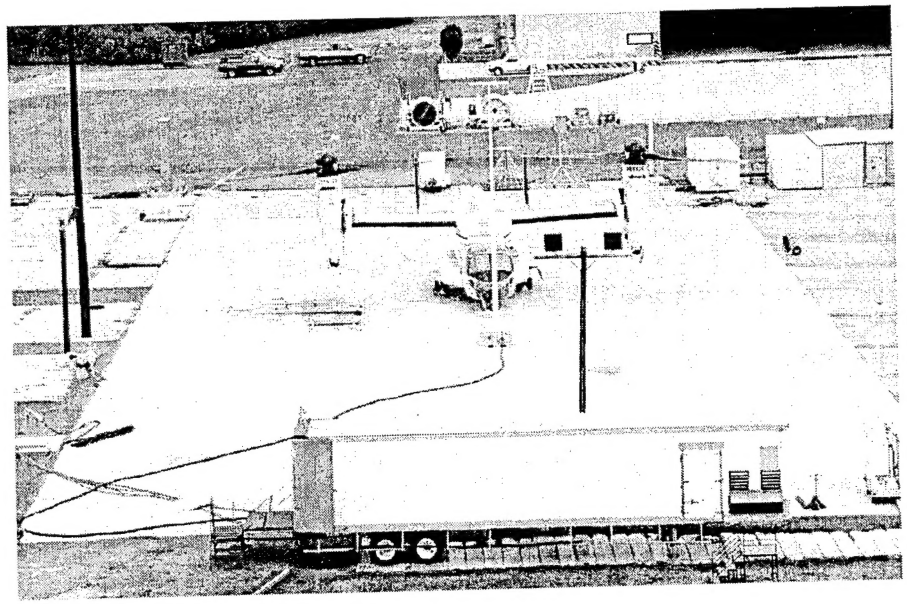
Naval Electromagnetic Radiation Facility

Continuous Steel Ground Plane

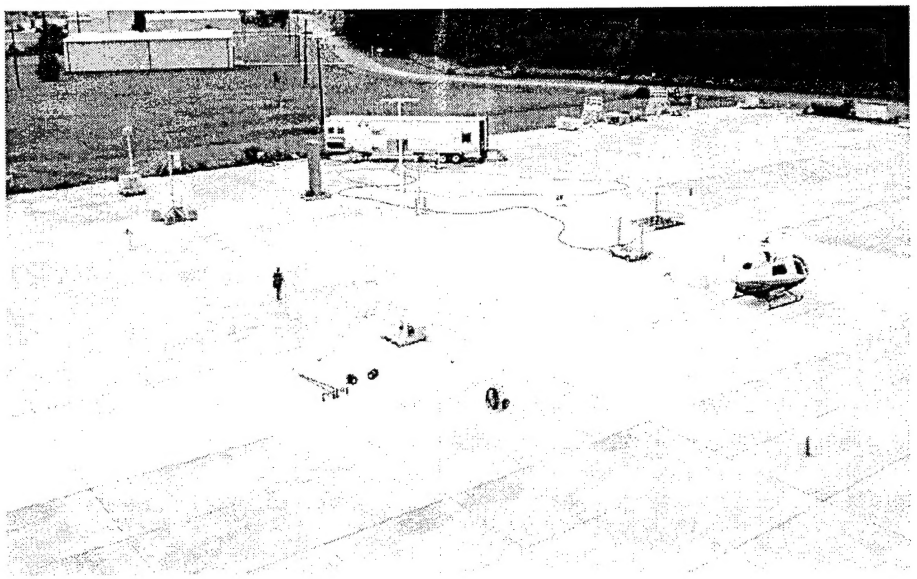
- **100' Wide x 240' Long Steel Ground Plane with a modified set of Alameda Chocks with blast deflector**
  - Electric Service
    - 480VAC, 60 Hz, 3-Phase Delta, 400 Amps (8 100 AMP Receptacles)
    - 120/208 VAC, 60 Hz, 3-Phase Wye 100 KVA Service
    - 115VAC, 400 Hz, 3-Phase Delta, 200 KVA Service (Standard DOD Aircraft Plugs)



Hangar Apron

- **300' wide x 600' long Apron in front of the Shielded Hangar**
  - Embedded 200' wide x 400' long, wire grid (10' x 10') ground plane under the concrete
  - Electric Service

    480VAC, 60 Hz, 3-Phase Delta, 400 Amps (5 100 AMP Receptacles)
  - Aircraft Turns Allowed



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AATF

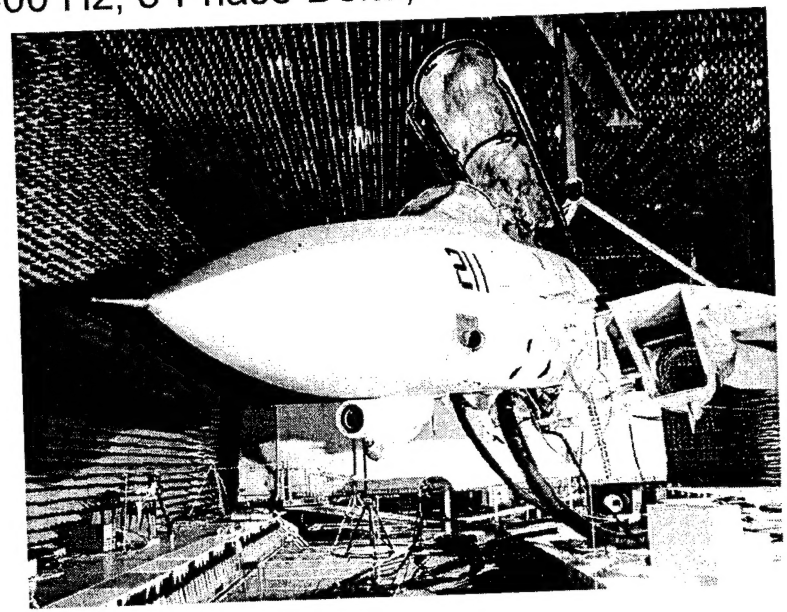
- **Aircraft Anechoic Test Facility (limited frequency coverage)**
  - Electric Service

    480VAC, 60 Hz, 3-Phase Delta

    120/208 VAC, 60 Hz, 3-Phase Wye 100 A Service

    Standard DOD 28VDC Aircraft Power

    115VAC, 400 Hz, 3-Phase Delta, 200 kVA Service (Standard DOD Aircraft Plugs)



Naval Electromagnetic Radiation Facility

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Inside Hangar

- **Inside the Shielded Hangar (limited frequency coverage)**
  - Electric Service

    480VAC, 60 Hz, 3-Phase Delta, 400 Amp Service

    120/208 VAC, 60 Hz, 3-Phase Wye 100 KVA Service

    Standard DOD 28VDC Aircraft Power

    115VAC, 400 Hz, 3-Phase Delta, 200 KVA Service (Standard DOD Aircraft Plugs)

Limited Frequency Coverage

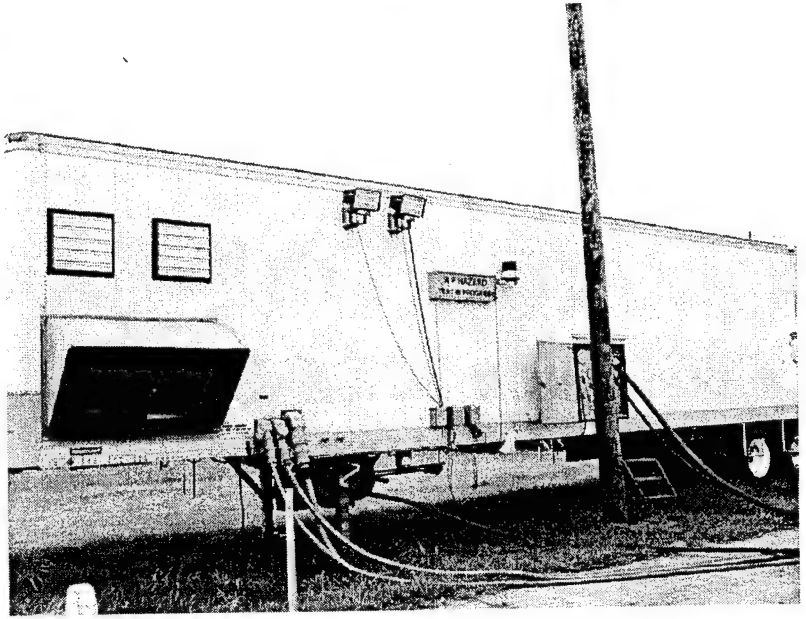
- Frequencies and power levels are limited to those frequencies and power levels for which safety of personnel and equipment can be maintained and must be evaluated on a case by case basis. Generally, frequencies above 1 GHz are ok.

Test Vans

- TV#1
- TV#2
- TV#3
- TV#4
- Telemetry Van

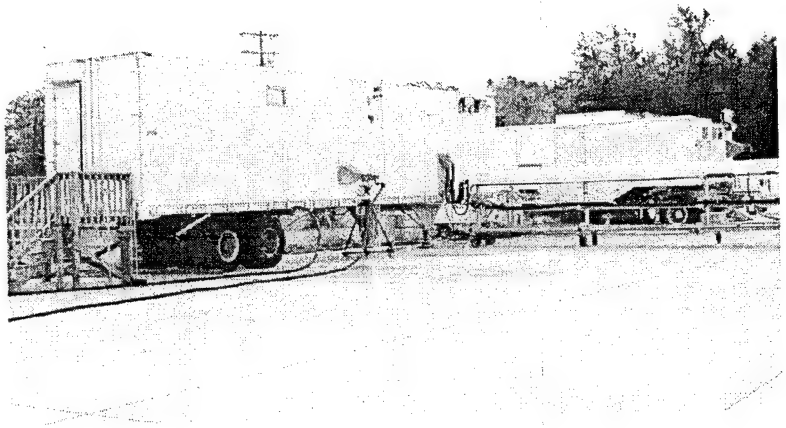
TV#1

- Contains Class A High Power Amplifier Systems
- 45' Semitrailer
- Self Contained Heating and Cooling
- Two Separate, Completely Shielded Rooms
- 30' Waveguide Cart Attached to Side
- Requires 3 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacles



TV#2

- Contains the Cober 1-34 GHz Magnetron Transmitter
- 45' Semitrailer
- Self Contained Heating and Cooling
- 30' Waveguide Cart Attached to Side
- Requires 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacle



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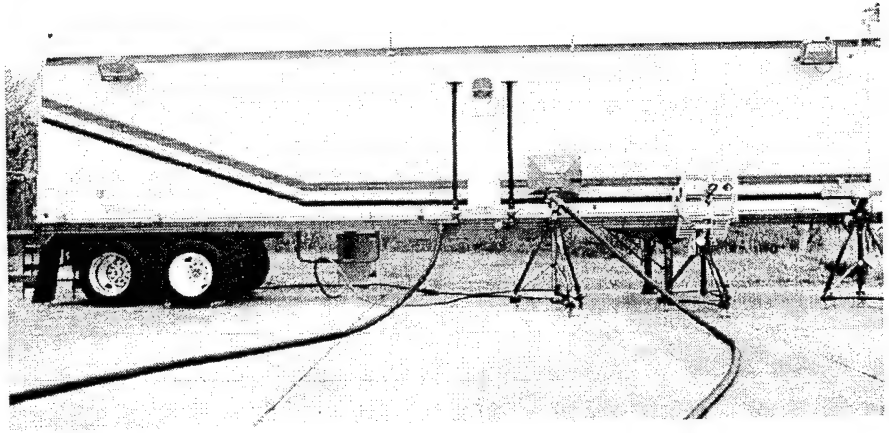
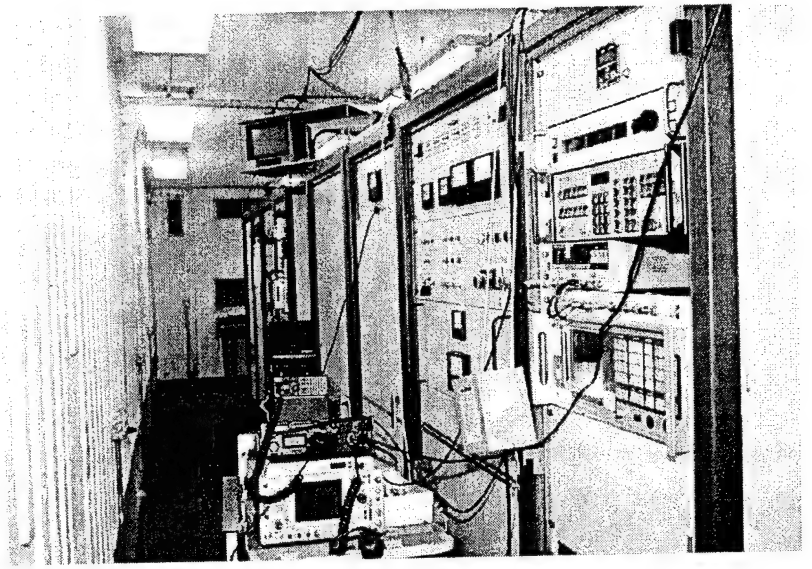
TV#3

- Contains the B&C (400 & 900 MHz) Transmitters
- 45' Semitrailer
- Self Contained Heating and Cooling
- Requires 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacles





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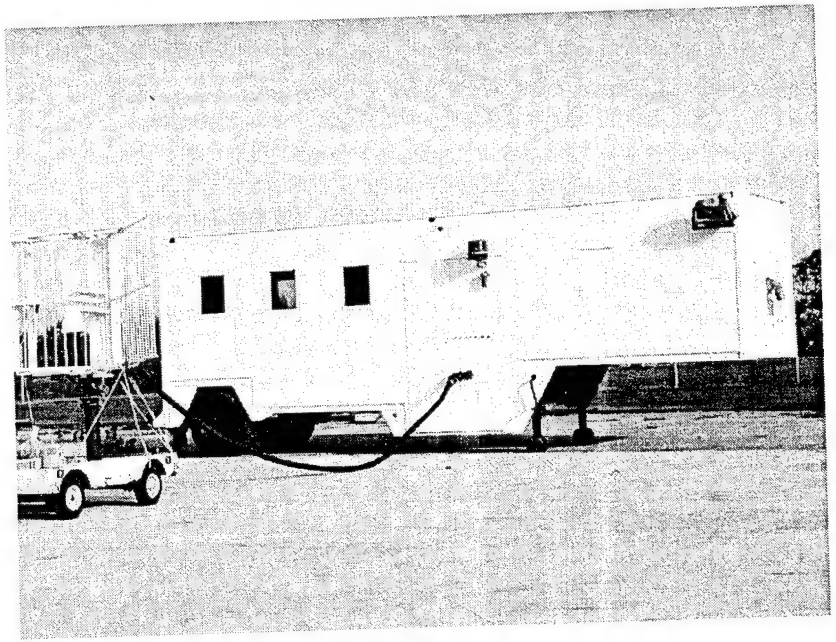
TV#4

- Contains the A Band (200 MHz) Transmitter
- 25' Lowboy Semitrailer
- Self Contained Heating and Cooling
- Requires 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacle (1 50 Amp min.)



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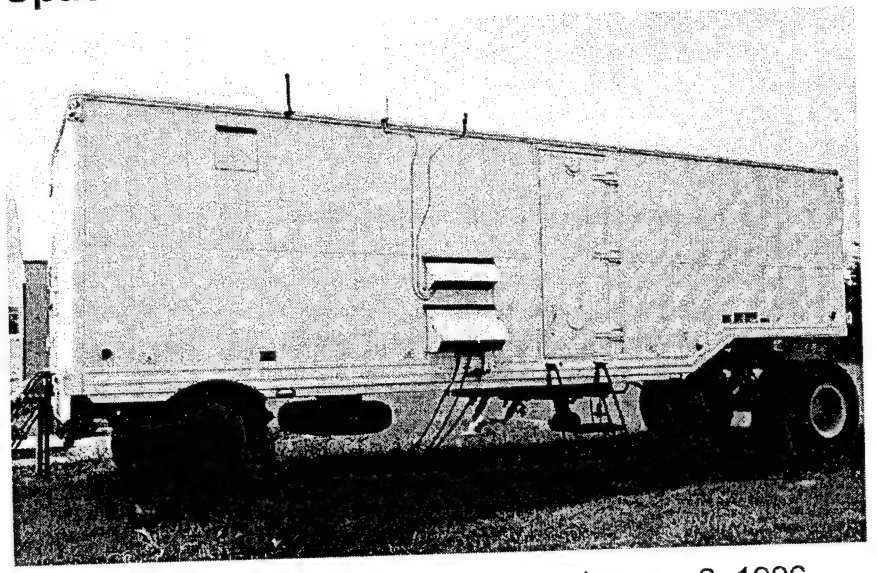
Telemetry Van

- 8' x 25' Shielded Military COMM Van
- Self Contained Heating and Cooling
- 120/208, 60 Hz Power Available
- Minimum 50' of Power Cord
- Requires 408VAC, 60 Hz, 3-phase Delta, 100 Amp GSE Receptacle
- Built In Work Benches and Open Floor Space
- Bulkhead Feedthrus, VHF Radio



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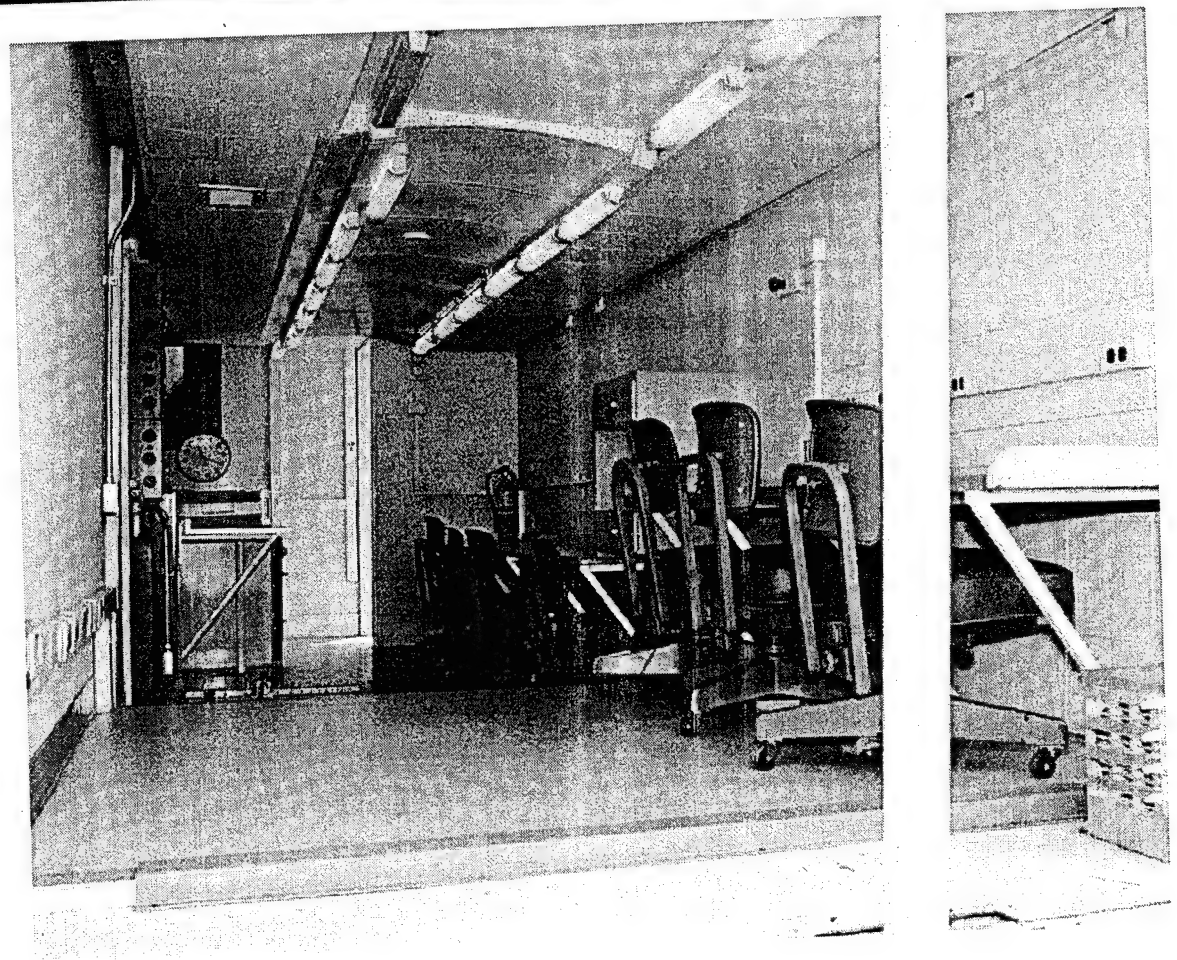
Telemetry Van Layout



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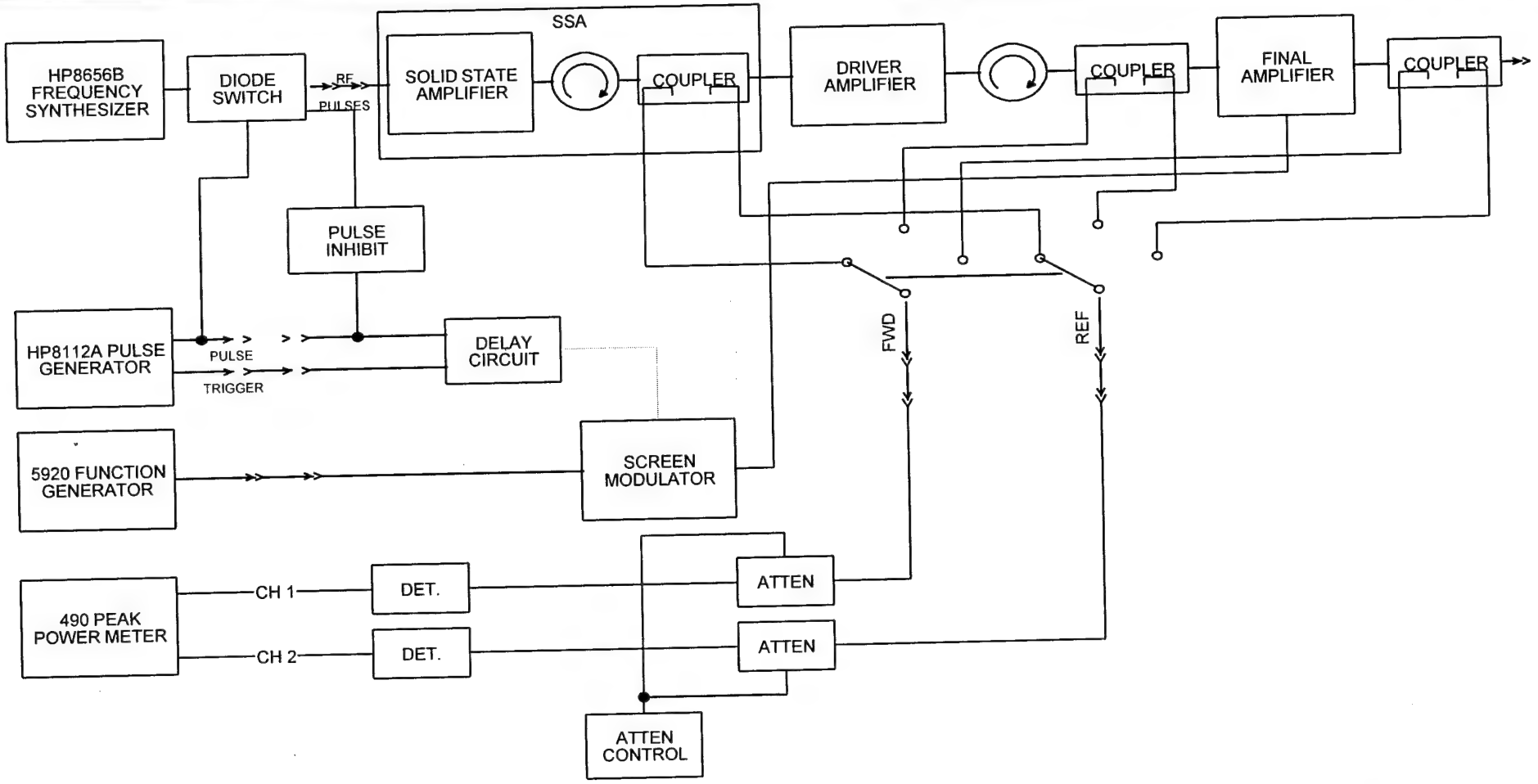
Radar Transmitters

- Discrete Frequency Tuned
- Magnetron and Tetrode Tube Based
- Antenna Scan Parameter Simulations
- No EW Modulation Capabilities

A&B Bands Block Diagram



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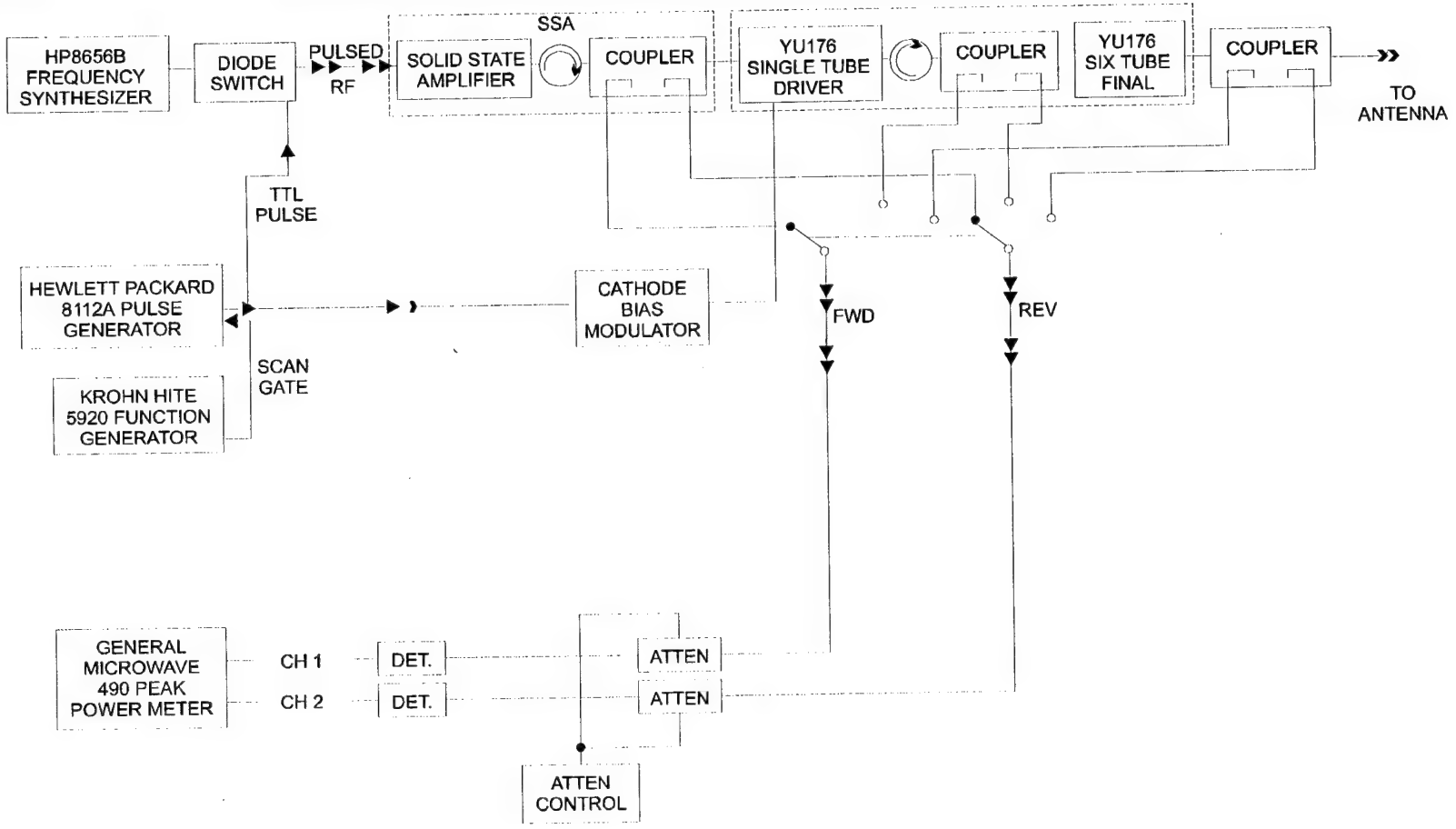
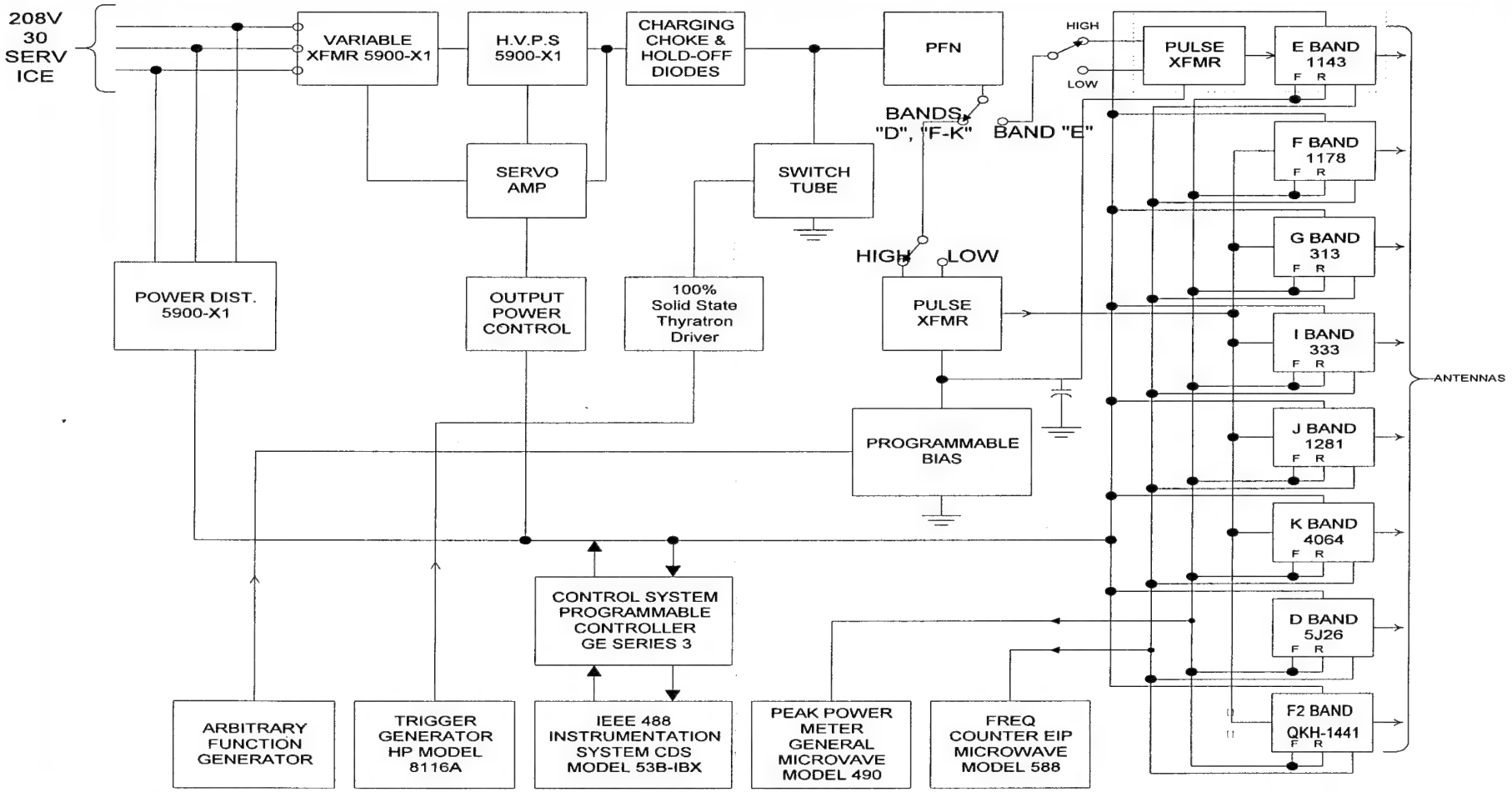
C Band Block Diagram



Cober Block Diagram



Radar Transmitter Parameters

Transmitter	Band	Freq Range (GHz)	PW (uS)	PRF (Hz)	Max Duty Cycle	Max Peak Power (KW)
H-6 A	A	.2-.24	1-200	<1000	.01 .007	225 325
H-6 B	B	.39-.48	1-200	<1000	.01 .007	225 325
H-6 C	C	.870-.940	1-50	<1000	.01	100
Cober	D	1.22-1.35	1,1.5,2,3,4	<1000	.001	400
	E	2.88+.03	.5,1.5,2	<1600	.0008	2850
	F	3.1-3.65	1,1.5	<1466	.002	1000
	G	5.4-5.9	.5,1,1.5,2	<2000	.001	1000
	I	14-15.2	1,1.5,2	<2000	.001	100
	J	35	.5,1	<2000	.001	125

Radar Transmit Antennas

Band	Antenna Make	Part Number	Freq. (MHz)	Gain (dBi)	3 dB BW E/H Plane	2M Illum. Area (ft2)	E Plane Width (M)	H Plane Width (M)
A	Chu Corner Reflector	CA-3524	195 220 245	12.8 11.1 12.9	56.5/37 50/38.5 44/35.5	30 19.8 20.6	2.1 1.3 1.6	1.33 1.39 1.28
B	Chu Corner Reflector	CA-3525	385 435 485	11.5 11.8 12.8	53.5/45 55.5/40.5 48.35.5	35.5 33.2 24.5	2 2.1 1.78	1.65 1.47 1.28
C	Seavey Engr Assoc Horn	SGA-07	850 900 910 940	15.1 15.5 15.6 15.8	27/30 27/30 27/30 27/30	10.3	.96	1
D	Scientific Atlanta Horn	12-1.1	1250 1300 1350	15.2 15.5 15.7	30/27 30/27 30/27	10.3	1	.96
E	Seavey Engr Assoc Horn	HPH-27	2700 2800 2900	16.7 17 17.3	30/27 24/22 23/27	10.3 7.0 8.3	1 .85 .81	.96 .77 .96
F	Scientific Atlanta Horn	12-2.60	3100 3600	18.2 19.15	23/22 23/22	6.7	.81	.77
G	Scientific Atlanta Horn	12-3.9	5650	19.38	23/22	6.7	.81	.77
I	Systron Donner Horn	HPH-520	9200 9400	20.05 20.22	16/14 16/14	3	.56	.49
J	Scientific Atlanta Horn	12-12	14 GHz	24.15	9/10	1.1	.31	.34
K	Scientific Atlanta Horn	12A-26	35 GHz	24.7	9/10	1.1	.31	.34
K	4' Dish	SPN-42	35 GHz	48	0.5/0.5	1 @ 80'	.3	.3

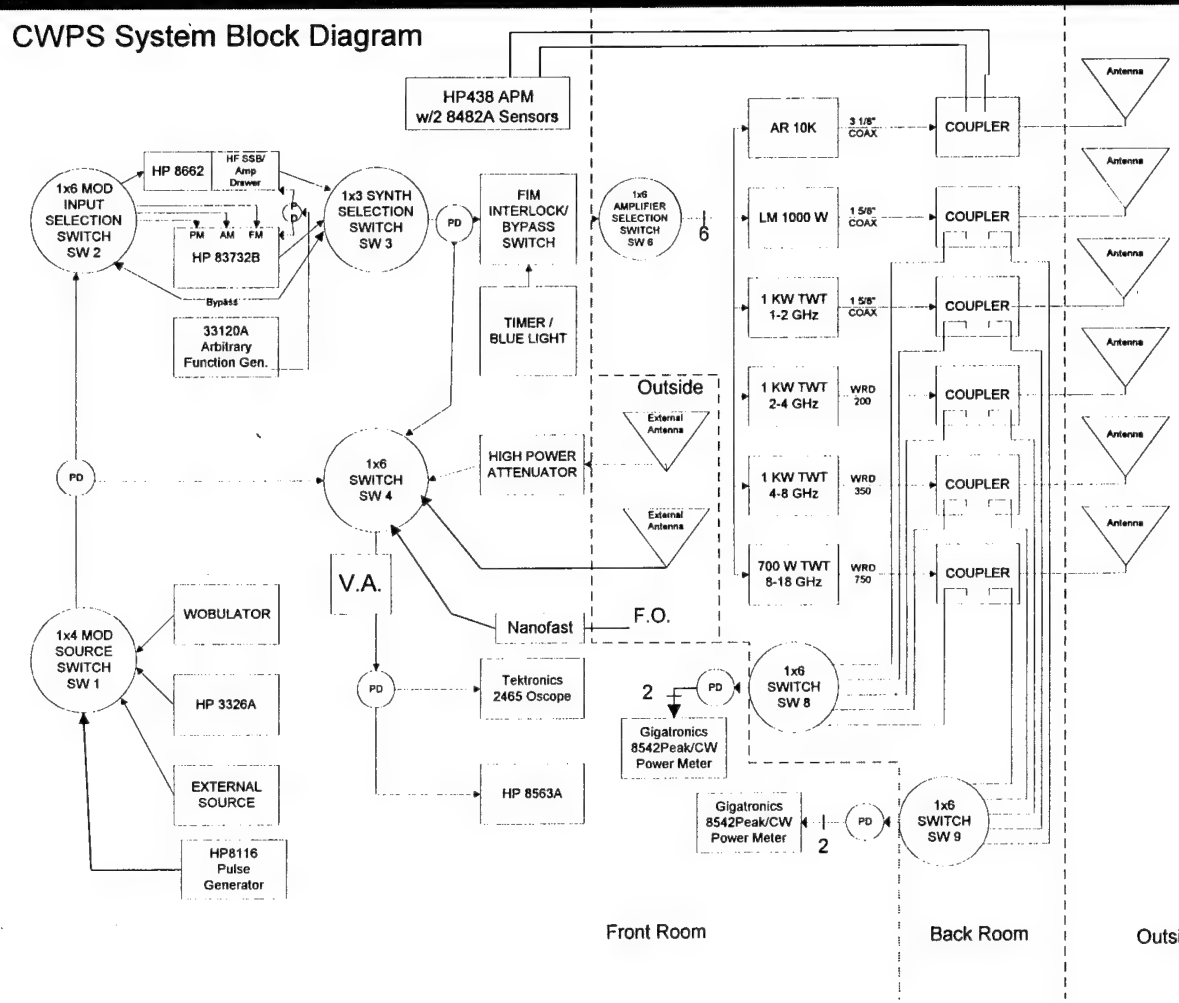
Radar Transmitters Maximum Peak Power Densities at the Near Field Boundary

BAND	DISTANCE (M)	PEAK POWER DENSITY (MW/CM2)	PEAK FIELD INTENSITY (V/M)	DUTY
A	6.5	2,131	2,835	.007
B	3.5	1,188	2,116	.01
C	3.8	1,243	2,165	.01
D	2.7	11,319	6,533	.002
E	2.0	73,562	16,653	.0008
F	2.5	30,200	10,669	.001
G	1.8	100,410	19,456	.001
I	1.0	106,554	20, 043	.001
J	2.1	2,238	2,905	.001
K	23.0	2,500	3,070	.001

Class A High Power Amplifier Systems

- Block Diagram
- Class A Amplifiers
- Synthesized Signal Generators
- Modulation Sources
- Summary Capabilities & Antennas
- E-Field Calibration Equipment
- Typical Maximum E-Field Levels

Class A High Power Amplifier System Block Diagram



Class A Amplifiers

Freq Range	Model Number	Min CW Power Output	Gain Flatness	Harmonic Levels
10 KHz - 100 MHz	AR 10,000L	10 KW	±1.5 dB	<20dB
100 MHz - 1000 MHz	AR LM1000W	1 KW	±2 dB	<20dB
1 GHz - 2 GHz	Logimetrics A682/L	1 KW	±1.5 dB	<20dB
2 GHz - 4 GHz	Logimetrics A682/S	1 KW	±1.5 dB	<50dB
4 GHZ - 8 GHz	Logimetrics A682/C	1 KW	±1.5 dB	<50dB
8 GHz - 18 GHz	Logimetrics A682/IJ	800 Watts	±1.5 dB	<50dB

CWPS Synthesized Signal Generators

Freq Range	Model Number	Internal Modulation	External Modulation	Modulation Modes
10 KHz - 1.28 GHz	HP8662	AM:0-95% Depth 400 Hz or 1 KHz Rate FM:400 Hz or 1 KHz Rate Deviation: ,100 KHz; very Frequency Dependent	AM:0-95% Depth DC- 10 KHz(freq dependent) Rate FM:DC - 100 KHz Rate Deviation: ,100 KHz; Very Frequency Dependent	AM FM AM/FM
10 MHz - 20 GHz	HP 83732B	Waveforms: Sine, Ramp, Square, Triangle, Uniform Noise, Guassian Noise AM: 0-99.9% Depth FM: 1KHz-1 MHz Rate <10MHz Peak Dev PM: 3Hz-3MHz PRF 25nS-419mS PW Scan: >60dB Depth Phase Modulation	Any Waveform compatible with band width considerations. AM:0-99.9% Depth DC - 100 KHZ Rate FM:10 Hz - 5 MHz Rate <10 MHz Deviation PM: PRF: 5 Hz - 5 MHz PW: >50 nSec On/Off Ratio >80 dB	Linear/Log AM FM PM AM/PM Phase Scan Modulation Phase/FM AM/PM/FM/Phase

Modulation Sources

- **Custom In House Developed Function Generators**
  - TV Signal Simulator
    - Standard and CATV Channels
    - Test Patterns or Live action
    - Choice of Audio
  - Pulse Generator
    - 1-99% Duty Cycle
    - 250nS Rise Time
    - 50nS Fall Time
  - Wobulator
    - 300-6000Hz Sweep Generator
    - 0.3-33 Hz Sweep Rate

Modulation Sources

- **HP3326A**
  - DC - 13 MHz
  - Sine, Square, Pulse, DC Waveforms
  - Modes
    - 2 Phase
    - 2 Tone
    - Pulse
    - Swept Frequency

Modulation Sources

- **External Source**
  - Any source compatible with the HP8662 or the HP83732 signal generators.
  - Any source that can drive a class A amplifier.

Antenna Scan Simulation

- HP33120A Function/Arbitrary Waveform Generator

  Standard Waveforms: Sine, Square, Triangle, $\frac{\text{Sin (X)}}{\text{X}}$,

  Arb Waveforms: 8 to 16K Points, 12 Bit Resolution

- Purpose: Realistic Emitters
  Limit/Control Personnel RADHAZ Exposure

Class A High Power Transmitters Summary Capabilities and Antennas

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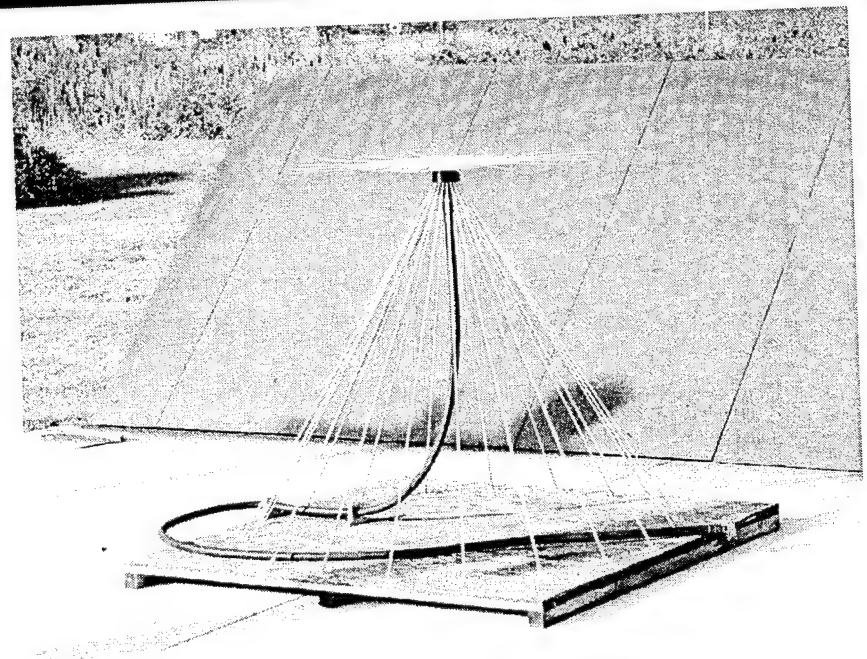
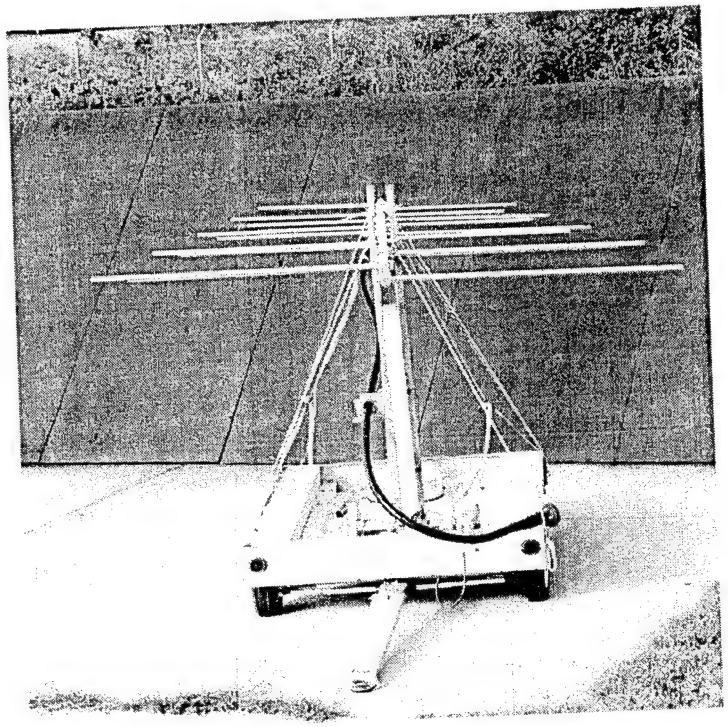
Freq Range	Modulation	Transmitter Power	Antenna Type	Antenna Polarization
10 KHz - 4 MHz	AM, FM, Pulsed, AM/FM, Wobulated(swept audio)	>15 KW	Long Wire	Vertical
4 MHz - 30 MHz	AM, FM, Pulsed, AM/FM, Wobulated, SSB	>15 KW	37' Trussed Whip	Vertical
30 MHz - 100 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	>10 KW	10' Discone	Vertical
50 MHz - 100 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	>10 KW	12' Log Periodic	Horizontal
100 MHz - 200 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	6' Log Periodic	Horz or Vert
200 MHz - 1000 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
1 GHz - 2 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
2 GHz - 4 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
4 GHz - 8 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
8 GHz - 18 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	800 W	Custom Double Ridge Horn	Horz or Vert

Class A High Power Antennas



* 30-100 MHz

* 50-100 MHz



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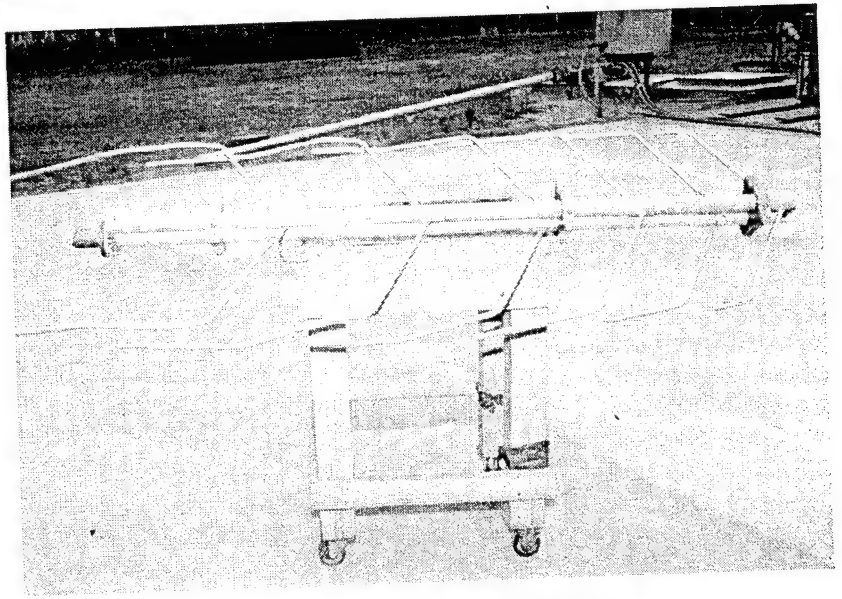
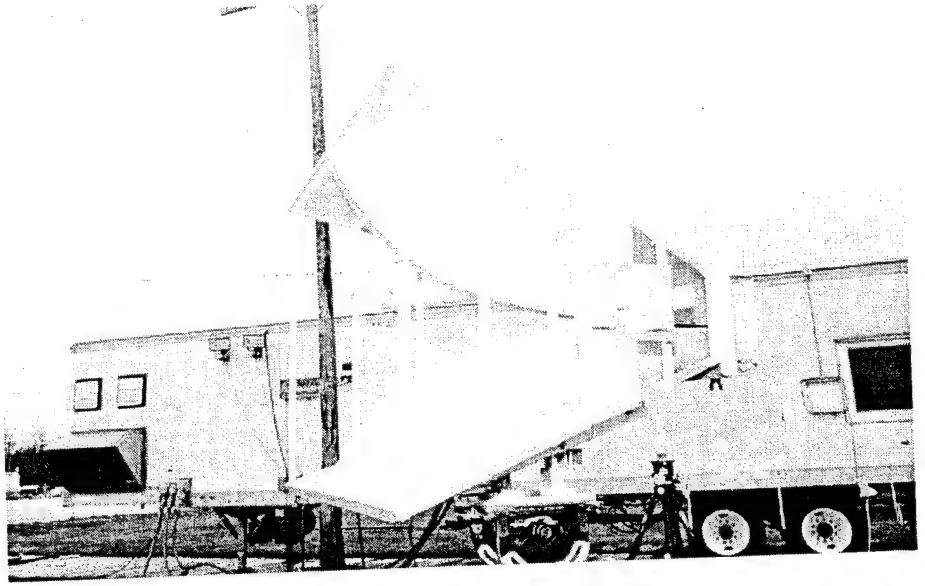
Naval Electromagnetic Radiation Facility

Class A High Power Antennas



* 100-200 MHz

* 200-1000 MHz



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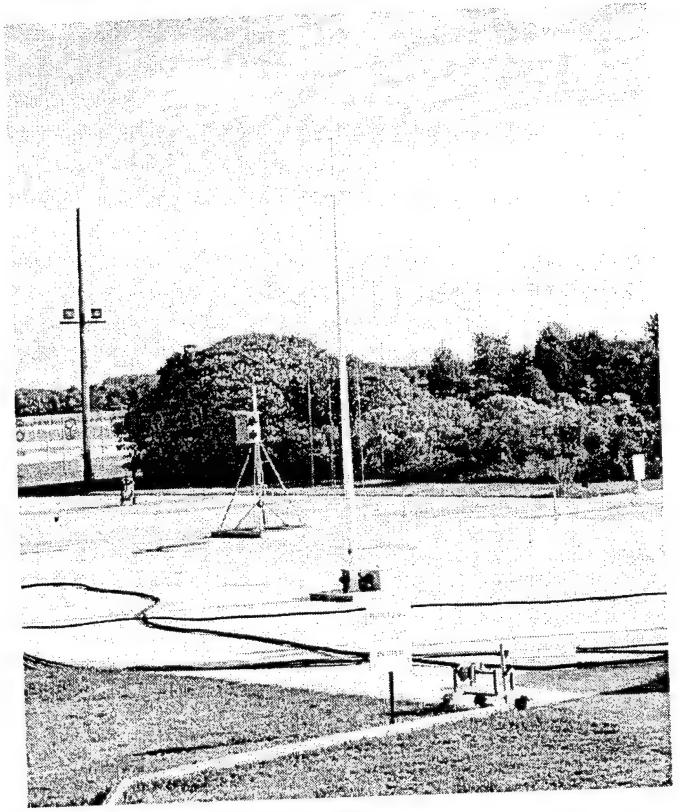
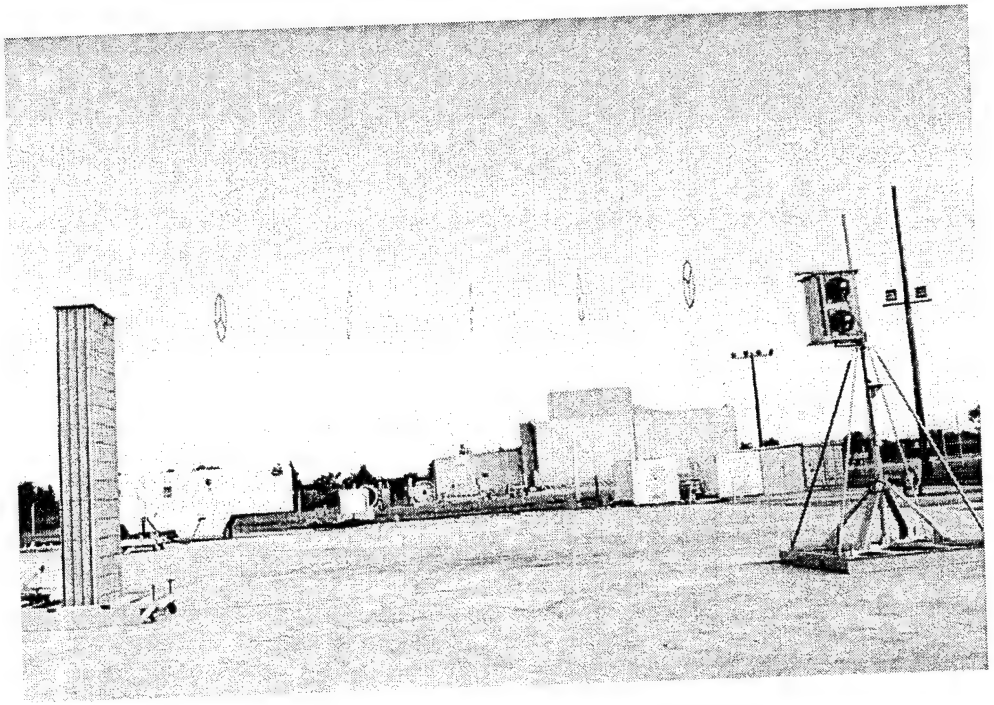
Naval Electromagnetic Radiation Facility

Class A High Power Antennas



* 4-30 MHz



*10 KHz-4 MHz

Naval Electromagnetic Radiation Facility

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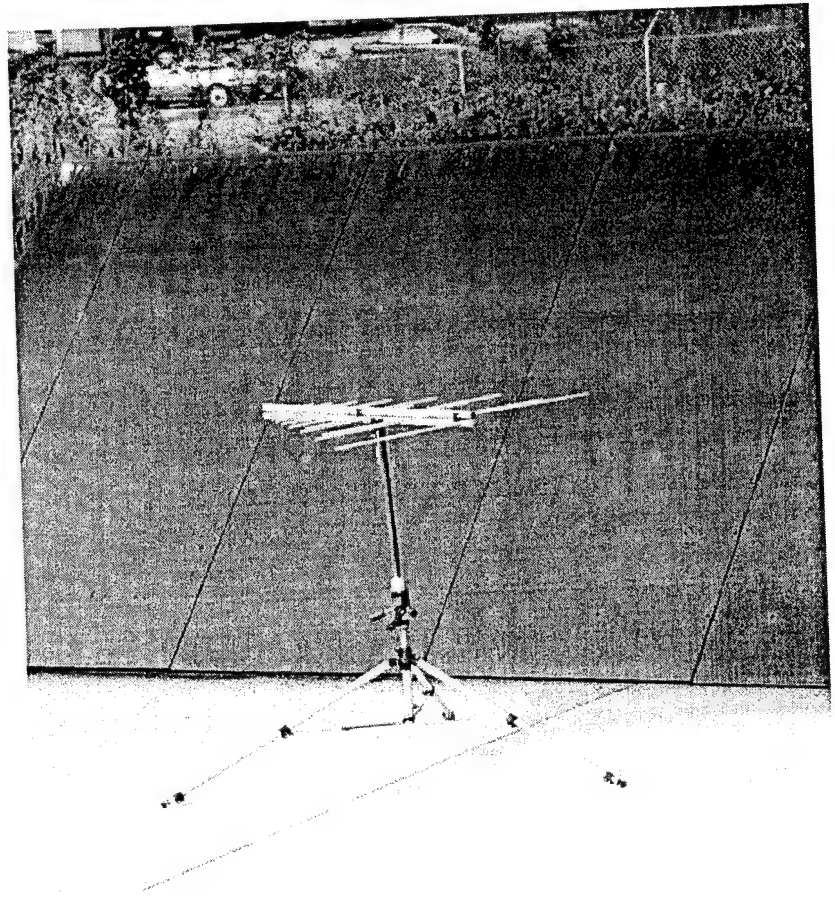
Class A High Power Antennas

* 100-1100 MHz

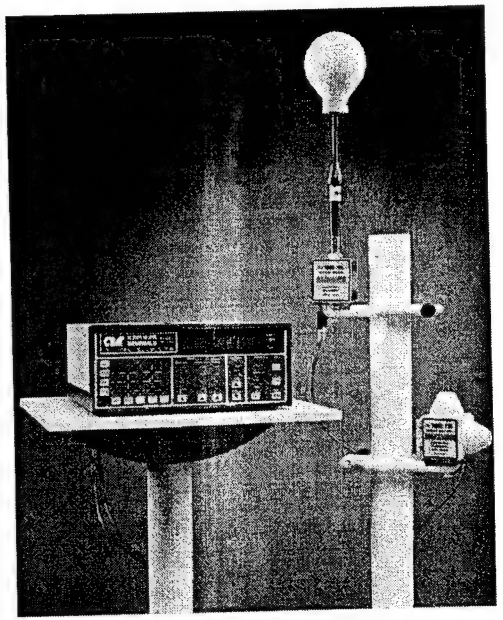


Naval Electromagnetic Radiation Facility

January 2, 1996

E-Field Calibration Equipment

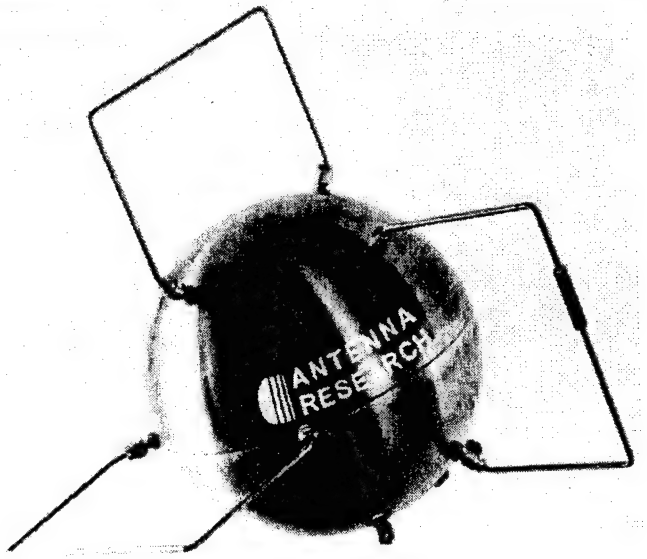
- **3 - Axis E-Field Probe**
  - Amplifier Research FP2000 Probe/FM2000 Meter
    - 10KHz - 1 GHz
    - 4-300 V/M ± 1dB
    - Up to 8 Probes, 2 meters Available



- **Amplifier Research FM 2000 meter, FP 2080 Probe**
  - 80 MHZ-40 GHZ
  - 1-300 V/M
  - 4 Probes, 1 Meter Available

E-Field Calibration Equipment (Cont.)

- **E x H Field Probe**
  - ARA IBS-30
  - Freq: 0.075-30 MHz
  - E-Field: 6-1500 V/M
  - H-Field: 0.04-6 A/M



- **Features**
  - Simultaneous E&H Field Measurements
  - Evaluation of Poynting Vector & Power Density
  - Evaluation of Wave Impedance

Typical Maximum E-Field Levels

- 10KHz - 18 GHz
- 10KHz - 4 MHZ
- 4MHz - 30 MHz
- 30 MHz - 100 MHz
- 100 MHz - 1 GHz
- 1 GHz - 18 GHz

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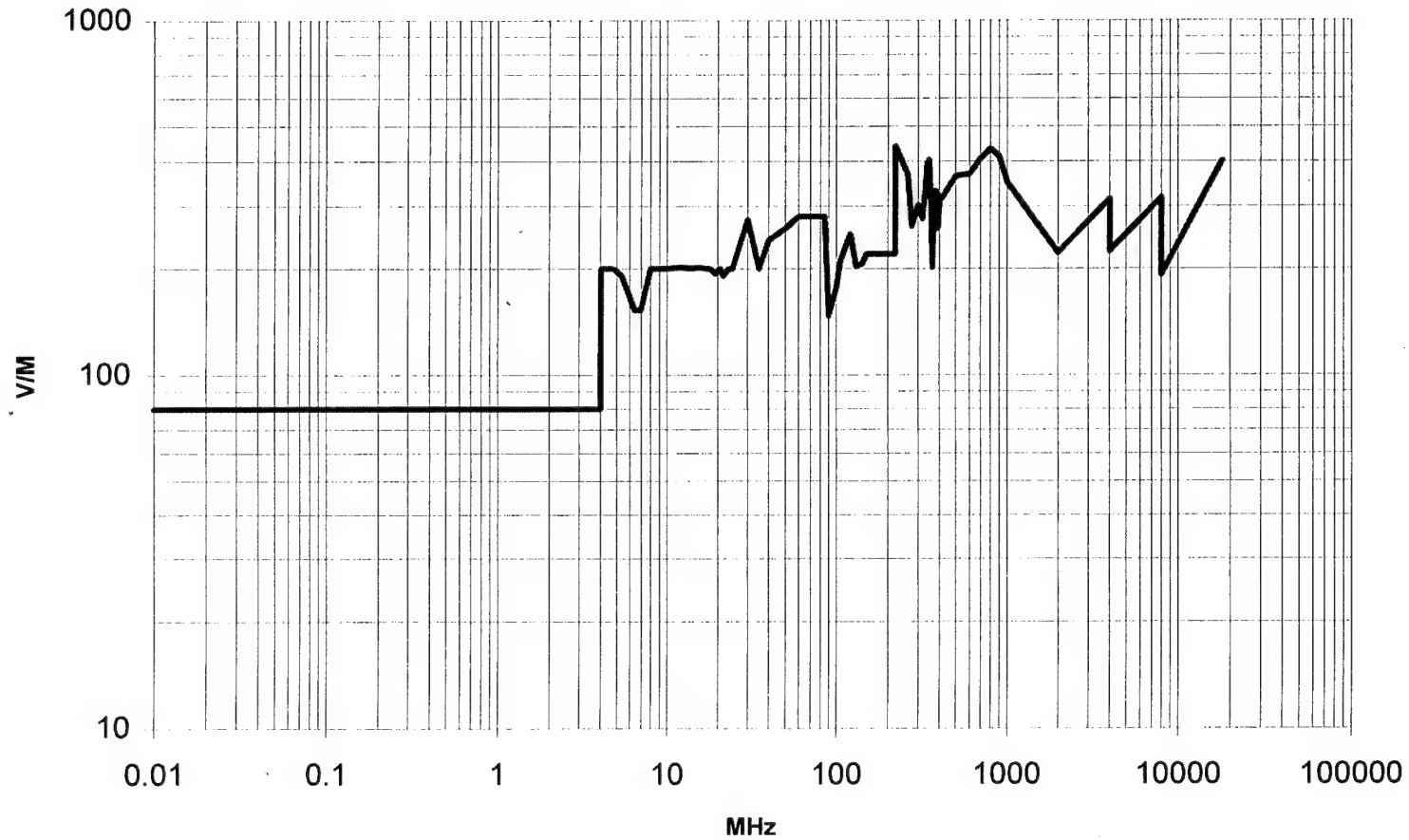
10KHz - 18 GHz

Max Possible E-Fields



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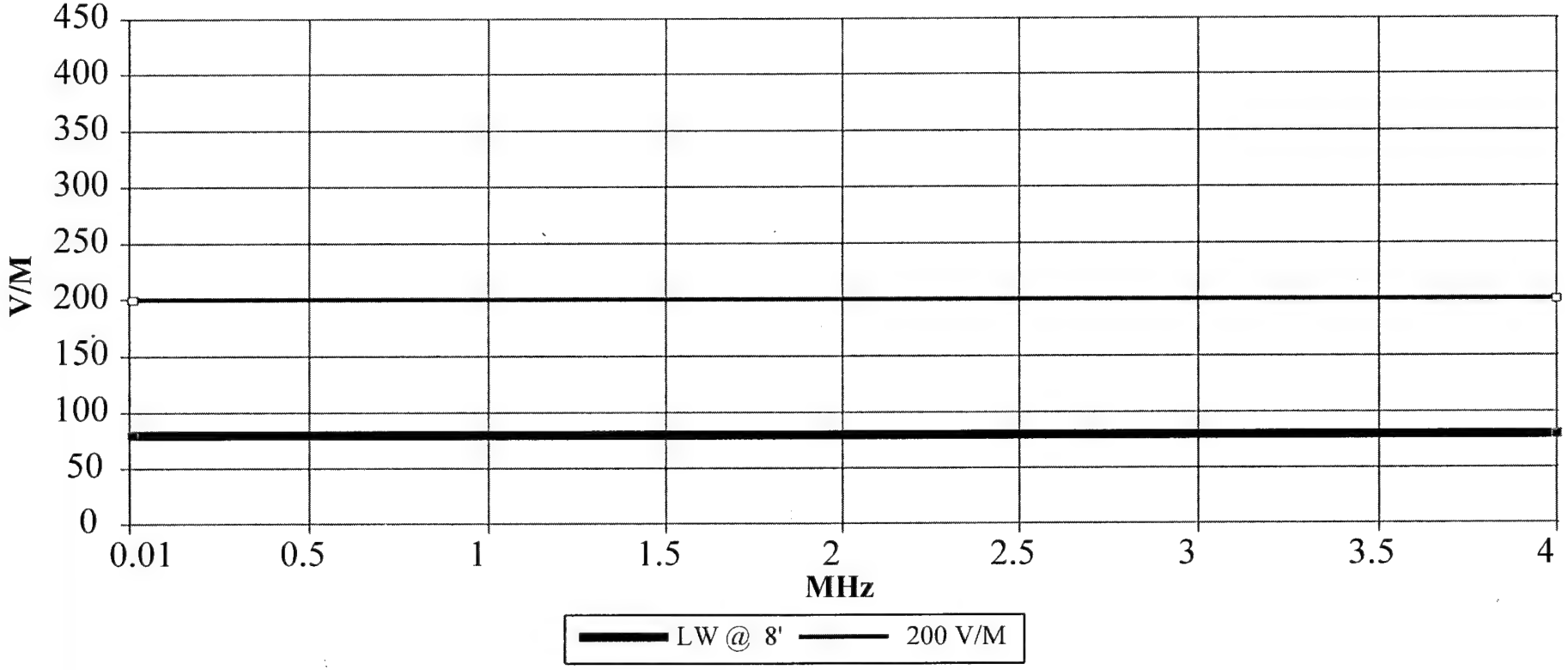
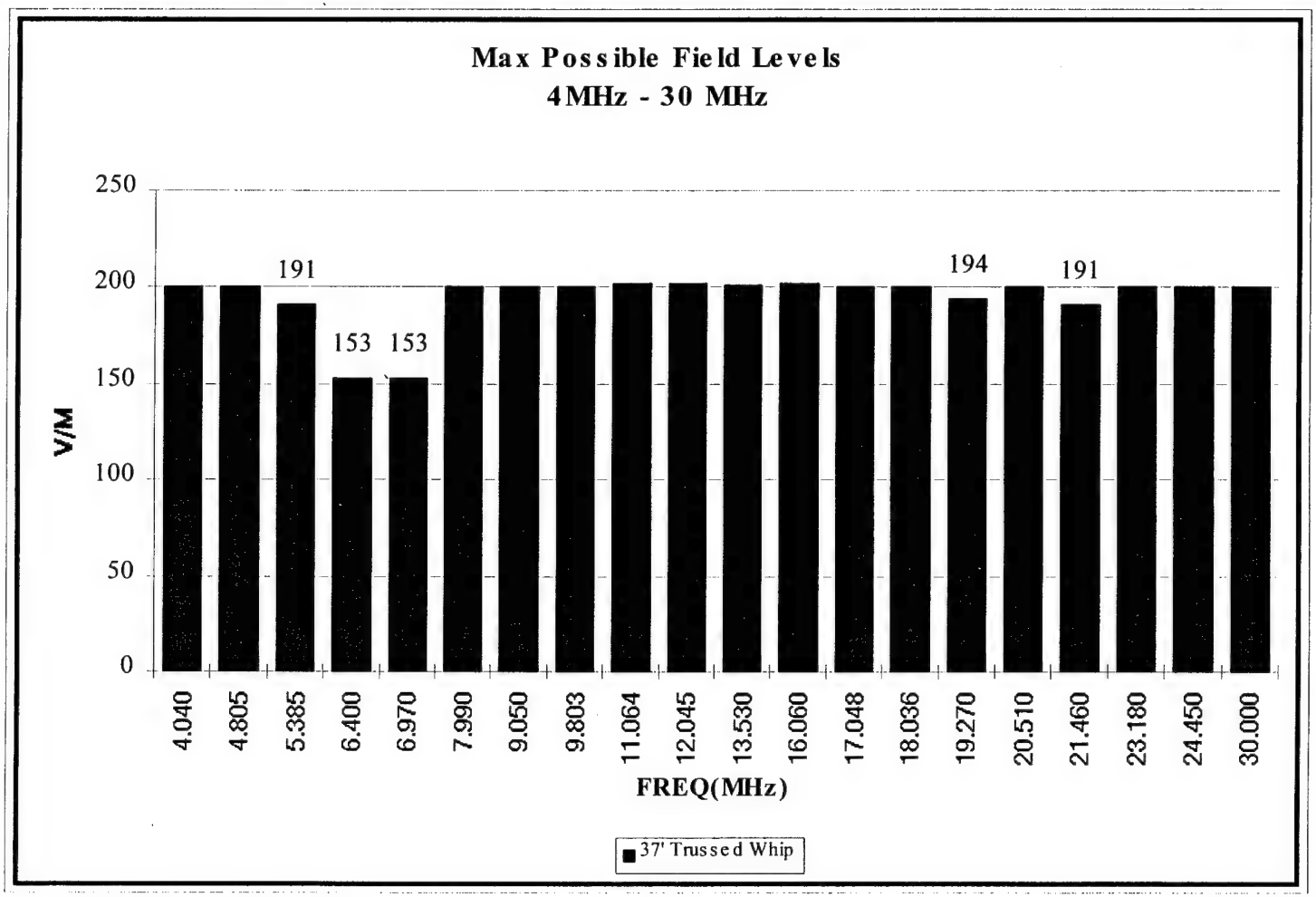
10KHz - 4 MHZ

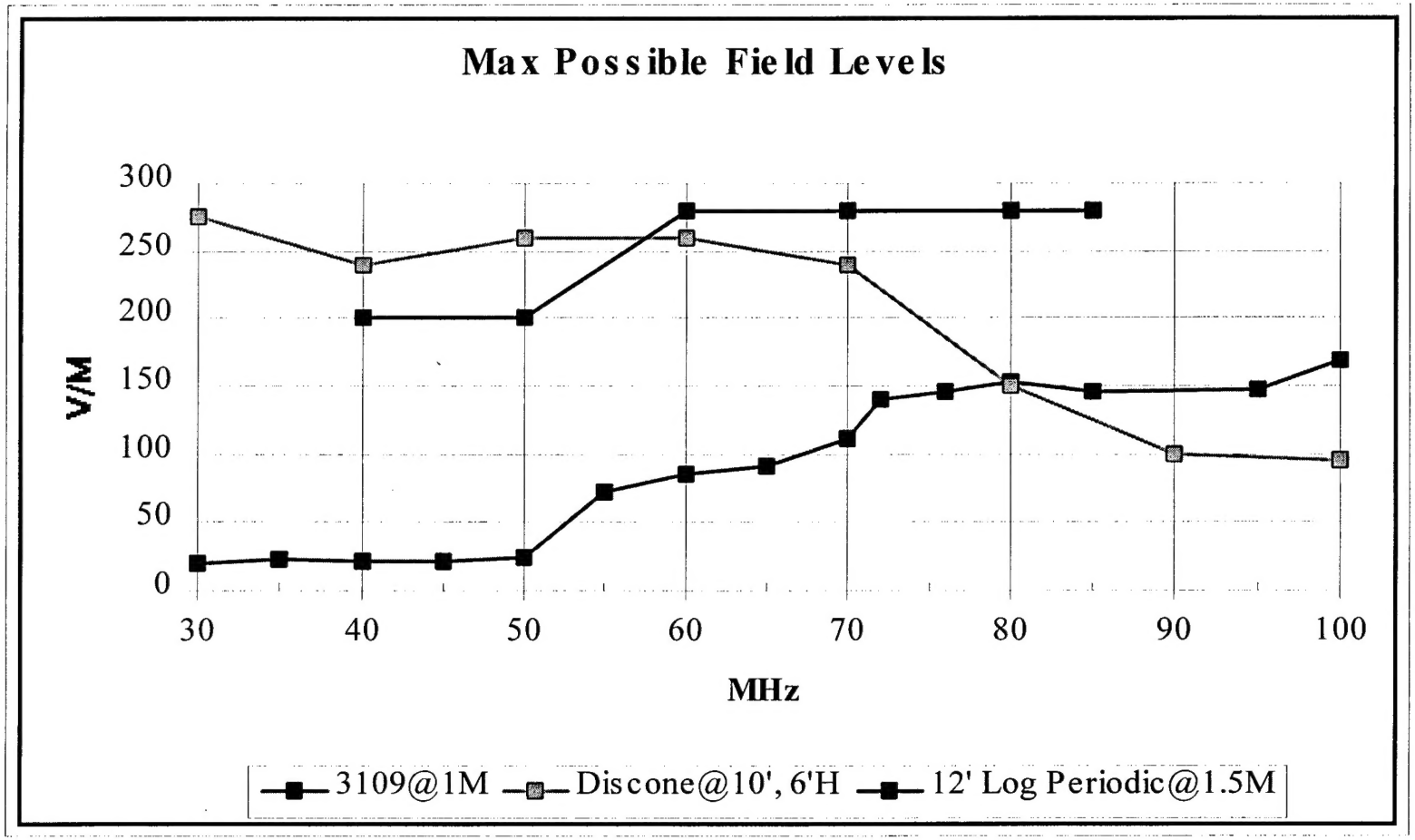
Max Possible Field Levels



4MHz - 30 MHz


Max Possible Field Levels
4MHz - 30 MHz
250
200
150
100
50
0
V/M
191
153
153
194
191
4.040
4.805
5.385
6.400
6.970
7.990
9.050
9.803
11.064
12.045
13.530
16.060
17.048
18.036
19.270
20.510
21.460
23.180
24.450
30.000
FREQ(MHz)
37' Trussed Whip

30 MHz - 100 MHz



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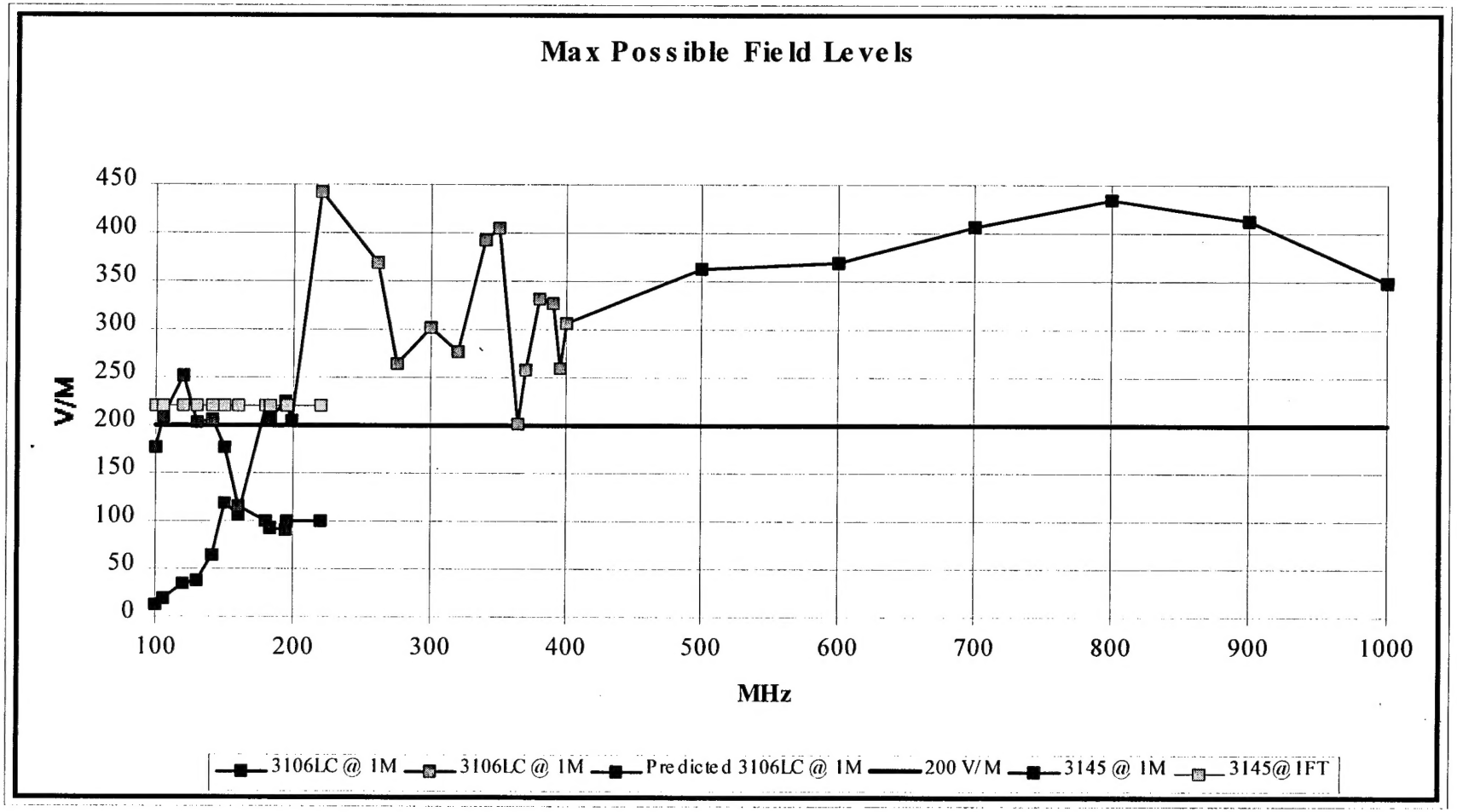
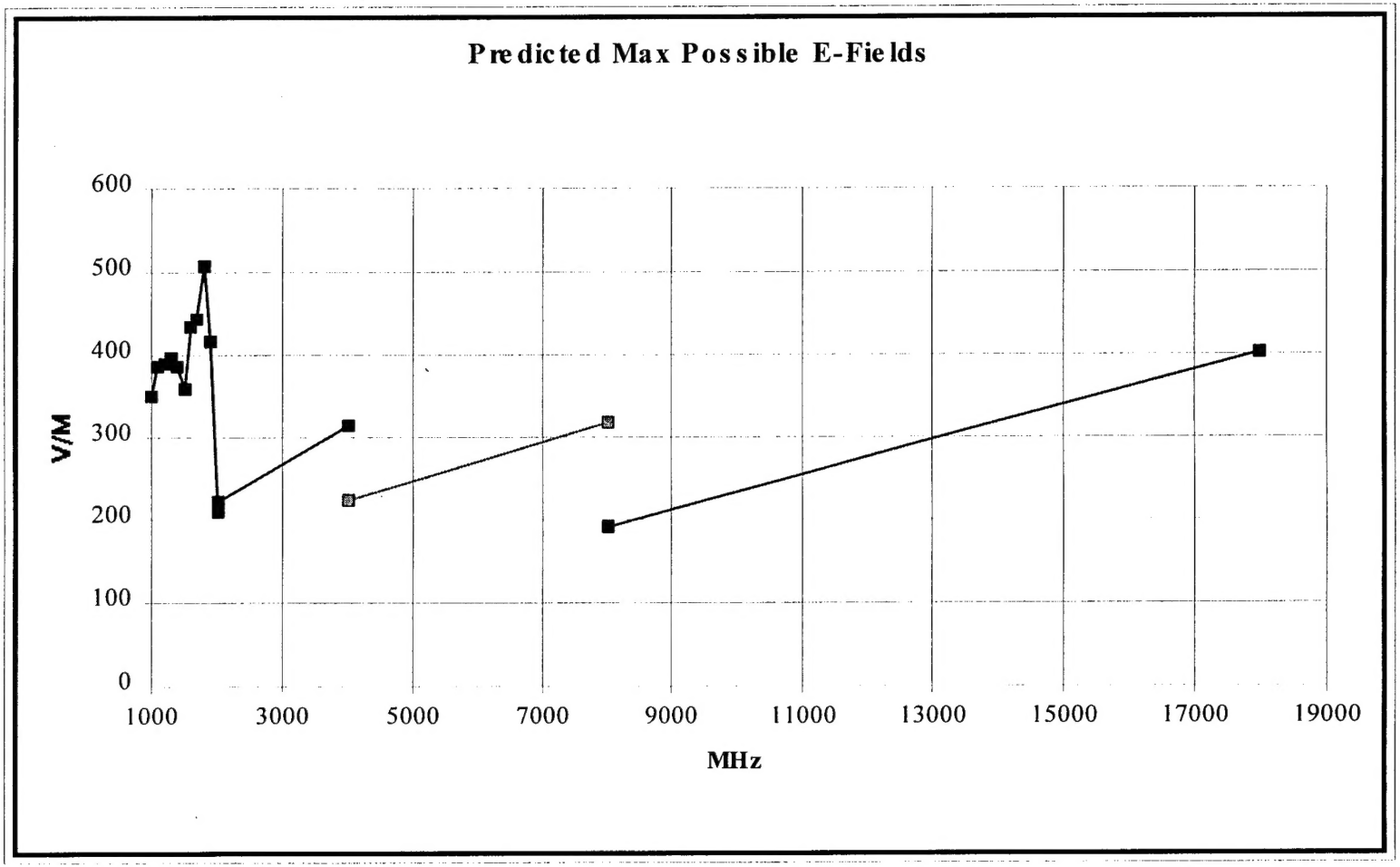
100 MHz - 1 GHz



1 GHz - 18 GHz


Predicted Max Possible E-Fields
600
500
400
300
200
100
0
V/M
1000
3000
5000
7000
9000
11000
13000
15000
17000
19000
MHz

Naval Electromagnetic Radiation Facility

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